REPORT ON THE EFFECTIVENESS OF

ENVIRONMENT, SAFETY, AND HEALTH MANAGEMENT SYSTEMS WITHIN THE DEPARTMENT OF ENERGY

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OFFICE OF OVERSIGHT
ENVIRONMENT, SAFETY AND HEALTH
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EXECUTIVE SUMMARY

In the past year, the Department of Energy's overall environment, safety, and health performance has continued to improve — most notably in the areas of public safety and environmental protection. The aging infrastructure of the nuclear complex continues to challenge the Department's ability to maintain operational effectiveness and improve its safety posture in the face of diminishing resources. The Department is managing an increasing number of activities, requiring a constantly changing skill mix. Many problems that the Department faces result from legacy operations when requirements were less stringent and long-term human and environmental effects were not as well understood. While the threat of large scale nuclear and chemical accidents is reduced, an unacceptable level of industrial-related accidents remains. A number of industrial-related accidents have occurred despite a "defense-in-depth" approach to safety.

There is evidence that line management's implementation of safety programs has improved, as they demonstrate a stronger commitment to safety. More structured operations are beginning to strengthen attitudes toward safety. Awareness levels have been elevated by increased openness, candor, and effective communication, especially with stakeholders. While there has been progress in implementing a sound safety management system across the Department, the following areas present significant challenges and warrant management attention as a prerequisite to achieving additional progress:

- Authorities, roles, and responsibilities
- Accountability and contract reform
- Authorization basis
- Assessment of safety performance and management of corrective actions
- Planning and control of work
- Conduct of operations
- Management of subcontractors.

With the Department's increasing mission emphasis on environmental management, the need to evolve from a system relying on the historical knowledge of a handful of experts to a disciplined integrated safety management system becomes critical. As existing expertise is lost and new areas of expertise are required, such an expert-based system cannot by itself ensure safety. Systematically capturing the knowledge of experts and institutionalizing safety practices are key elements of an enduring management system. These needs are reflected in the Department's integrated safety management program in response to Defense Nuclear Facilities Safety Board Recommendation 95-2.

The efforts of the Department, Congress, and the Defense Nuclear Facilities Safety Board have propelled the complex toward a safety management environment characterized by more structured operations, heightened safety awareness, and openness in identifying safety problems. While progress is slower than desired, the transition to a safer management culture that recognizes, identifies, and resolves safety weaknesses is a first step toward assuring safety.

INTRODUCTION

This document reports on the effectiveness of Department of Energy management systems in protecting the environment and ensuring the safety and health of its workers and the public during 1996.

The Department of Energy is a highly diversified organization, having responsibility for thousands of programs and projects that address both civilian and military needs. These include energy research and development, bulk storage of emergency fuel supplies, dismantlement and maintenance of the nuclear weapons stockpile, disposal of radioactive and toxic wastes, and the environmental cleanup of shutdown sites and facilities. This range of missions presents the Department with technical and institutional challenges that have the potential for significant environment, safety, and health impacts.

While hazards exist throughout the Department's sites, many safety concerns are attributable to the nuclear weapons manufacturing processes once performed. Although de-emphasized, these Cold War activities continue to present the Department with a preponderance of problems unlike anything found in private industry. Legacy waste, pollution, and contamination are prevalent throughout the 16 defense-related sites commonly referred to as the nuclear weapons complex. Departmental operations designed to manage these legacy problems are proceeding with caution. Efforts are ongoing at all sites to protect the environment and to minimize risks to the safety and health of onsite workers and offsite populations.

The Office of Oversight, in its role as the internal, independent overseer of the Department's safety management system, has in the past two years examined data on the Department's performance in the areas of public and worker safety and environmental protection. This effort has provided information on technical issues and underlying management systems that will be useful in promoting safe operations, as well as insights on the degree to which a culture conducive to safety is being established across the Department.

As the Office of Oversight has assimilated this information, performance trends have become apparent that offer opportunities for mitigating safety risks associated with current and future operations. This information provides the foundation and focus for this report.

APPROACH TO SAFETY MANAGEMENT

SAFETY MANAGEMENT OF OPERATIONS

The Department of Energy is committed to ensuring that all operations are performed in a manner that will minimize risks to the environment and the safety and health of its onsite workers and the general public. The Department's strategy for achieving effective safety management performance continues to be guided by a set of safety principles that include: the accountability of line management for the safety of operations, the cognizance and use of acceptable technical and management standards to control operations, the knowledge and competence of those charged with making technical and management decisions that impact operations, and the effective control and management of hazards commensurate with their risk.[1]

While the Department's line managers are responsible for creating an atmosphere of rigor and thoroughness to ensure that acceptable levels of safety are achieved, other activities within the Department serve to provide independent confirmation of the effectiveness of safety management systems. Congress, the Defense Nuclear Facilities Safety Board, and the Department recognize that achieving a sustainable safety management program requires an integrated, centralized organization to oversee safety management program implementation and to provide an essential check and balance.

Weaknesses in the Department's safety management systems have had significant consequences, as evidenced by two serious accidents in 1996.[2] Independent oversight of Department activities can mitigate safety risks by identifying deficiencies and using lessons learned from experience to strengthen implementation of safety management practices.

THE INDEPENDENT OVERSIGHT PROGRAM

In late 1994, the Assistant Secretary for Environment, Safety and Health established the Office of the Deputy Assistant Secretary for Oversight to provide independent evaluations of safety management systems throughout the Department in order to ensure that:

- Serious weaknesses in safety management systems are promptly identified, corrected, and associated lessons learned are shared

- The Secretary, Department of Energy and contractor managers, and the public have an accurate, timely, and comprehensive understanding of the impact of the Department's activities on the environment and on the safety and health of workers and the public.

[1] Throughout this report, the term safety management refers to environment, safety, and health management.

[2] Table 1 at the end of this document lists those reports pertaining to the electric shock accident at the Los Alamos National Laboratory and the fall accident at the Idaho National Engineering and Environmental Laboratory as well as reports on other activities performed by the Office of Oversight in 1996.

In fulfilling its mission, the Office of Oversight provides independent assessment of line management's effectiveness in implementing safety programs.

INDEPENDENT OVERSIGHT TOOLS

The Department's transition from nuclear weapons production to shutting down and cleaning up sites is accompanied by a variety of challenges, including new and different hazards, historic risks that are sometimes intensified, personnel reductions, contract reform measures, and changing skill mix requirements. These challenges affect the Department's ability and approach to effectively protect its workers, the public, and the environment. The Office of Oversight has adapted to this climate by implementing a variety of techniques to evaluate the effectiveness of the Department's safety management systems and to identify opportunities for improvement in these systems. These techniques are described below:

EVALUATIONS, REVIEWS, AND SPECIAL STUDIES: Sites, facilities, operations, and programs of special interest are targeted by the Office of Oversight for rigorous evaluation. Multidisciplinary inspections and focused, rapid-response reviews of safety programs are performed to identify problem areas and exemplary practices. Feedback is provided to line managers and stakeholders; internal Department management and outside entities (e.g., Congress) are kept advised on the status of safety policies and programs.

ACCIDENT INVESTIGATIONS: Accident investigation review boards are assembled to immediately respond to Type A accidents (e.g., fatalities) to evaluate and learn from these unfortunate experiences. The boards analyze these events to identify the, contributing and root causes. Judgments of need are developed to prevent recurrence of similar accidents in the future.

SURVEILLANCES: The Office of Oversight's Environment Safety and Health Residents maintain a daily, onsite presence at key Department of Energy sites to monitor safety practices in the workplace. These individuals perform routine surveillances to evaluate the effectiveness of line management's implementation of safety programs. Through daily walk-arounds, these individuals inspect and observe work in progress and provide real-time verification of the effectiveness of safety programs. Office of Oversight Environment Safety and Health Residents conducted more than 100 surveillances during 1966.

PERFORMANCE ANALYSES: The Department's methods of measuring and influencing safety performance have not kept pace with fundamental changes taking place across the complex. The Office of Oversight, through its enhanced analysis initiative, routinely and rigorously analyzes safety management performance in a manner that guides its field appraisal activities. In turn, the results of its field appraisals are used to provide input to its analysis efforts.

FOLLOWUP ACTIONS: Office of Oversight integration teams are responsible for identifying safety management issues that originate from any of the above activities. Followup actions are intended to examine line management's plans for addressing identified weaknesses and the effectiveness of plan implementation. These actions can range from remote review of documentation to first-hand observation of performance.

SAFETY MANAGEMENT SYSTEM EFFECTIVENESS

OVERVIEW

During 1996 the Office of Oversight continued to establish a baseline of information on line management safety programs. Vast amounts of data were accumulated, reviewed, and evaluated. These efforts yielded information on management systems that support safety and protection of the public, the worker, and the environment. They also lent insight into underlying technical issues and provided a perspective on the degree to which a safety culture is being established throughout the Department.

The Department's overall safety performance is improving in terms of protecting the public, the workers, and the environment. A stronger commitment to safety and an enhanced culture of safety is evident Department-wide, as demonstrated by more structured operations, an elevated awareness of safety, and an increased openness to and associated mechanisms for raising and resolving safety issues. Although hazards are generally managed in a manner that assures an acceptable level of safety performance for a given activity or operation, improvements are necessary in systems designed to protect worker safety.

PUBLIC SAFETY: Most Department facilities and their operations support the protection of public health. Reduced safety risks to the public from legacy waste are evident at sites that are actively identifying, consolidating, and containing radioactive and hazardous materials. This is an ongoing, long-term process.

Because of the age and material condition of some facilities, protection of public health cannot rely exclusively on engineering design, but must also rely on operational controls to compensate for older and sometimes less reliable designs and facility conditions. Consequently, the Department employs conservative approaches to safety analysis as part of upgrading authorization basis documentation, has begun to systematically identify and categorize hazards, and has instituted a framework for more effective work planning.

WORKER SAFETY: While the Department's focus on public safety has increased, its performance in promoting worker safety has not been as effective. Although many measures have been implemented to improve radiological and hazardous material handling and controls, the same emphasis is not found in traditional safety disciplines (e.g., electrical safety). The Department's principles governing conduct of operations generally are not adequately implemented at all levels of an organization or facility, and are not implemented consistently throughout the complex. Initiatives to address industrial risks are not keeping pace with the increased emphasis on environmental cleanup and restoration.

While there is no indication of significant risks from large-scale releases that might affect many collocated or in-facility workers, recent industrial accidents may serve as precursors to more serious events and may indicate more significant breakdowns in the safety management system.

Worker safety issues demonstrate the importance of assigning responsibilities and authorities for proper planning and control of craft activities. While public safety issues are often the focus of senior managers, whose responsibilities and authorities are clearly defined, construction and maintenance tasks are executed by workers with involvement of forepersons and first line supervisors. Data indicate that, at many Department sites, safety authorities and responsibilities are less clearly defined for individual positions the further they are from senior management. This weakness is evident in recent worker injuries and fatalities.

As an increasing number of operations are privatized or conducted by subcontractors, implementation of work controls will be further removed from Department senior management attention, and many worker safety issues could be magnified. The breaches of safety checks and balances evident in many recent industrial events suggest a potential erosion of the "defense-in-depth" measures designed to protect workers.

ENVIRONMENTAL PROTECTION: The Department's performance in environmental protection has improved. Heightened awareness of external environmental regulations has enhanced the Department's responsiveness to associated requirements. This is most apparent in efforts to reduce pollutant discharges from current operations. The Department is legally required to take such measures and is generally meeting these requirements—and, in some cases, exceeding the standards for reducing hazardous material releases.

The Department faces two distinct challenges in environmental protection. The first is to identify the significance of legacy contamination and the appropriate actions for containing the potential consequences. The second is to identify environmental vulnerabilities associated with current operations, hazardous material storage, and inventoried material awaiting decontamination and disposal. While many environmental contamination issues are legacy problems, hazardous material storage challenges will remain until processing and long-term storage actions are implemented.

CHALLENGES: There has been progress in implementing a sound safety management system across the Department; however, the following areas present significant challenges and warrant management attention:

- Authorities, roles, and responsibilities
- Accountability and contract reform
- Authorization basis
- Assessment of safety performance and management of corrective actions
- Planning and control of work
- Conduct of operations
- Management of subcontractors.

These areas are vital to safety, and remedying identified weaknesses offers the Department the potential to enhance the overall effectiveness of its safety management system.

DELINEATION OF AUTHORITIES, ROLES, AND RESPONSIBILITIES

Authorities, roles, and responsibilities for Department of Energy and contractor environment, safety, and health personnel are not always defined in sufficient detail to provide clear expectations of safety management functions and interfaces.

For many sites, safety responsibilities are less clearly defined for individual positions the further they are from senior management. This weakness is evident in recent worker injuries and fatalities. The Department's trend toward privatization of operational functions reinforces the need to ensure that authorities, roles, and responsibilities are understood.

For construction activities involving decontamination and decommissioning, management responsibility and accountability for construction safety performance is not effective. Decontamination and decommissioning operations often employ multiple contractors with sub-tier crafts workers, further complicating safety accountability. Construction activities are compartmentalized, fostering a lack of ownership by line management. Finally, there is confusion among middle managers concerning responsibility for integrating construction safety requirements across a site.

MECHANISMS FOR ACHIEVING ACCOUNTABILITY, INCLUDING CONTRACT REFORM

Efforts in contract reform serve to enhance line management commitment to safety by making financial success contingent upon demonstrating effective safety management. The effective use of safety performance measures and mechanisms for achieving individual accountability is being slowly recognized and institutionalized. Systems to ensure subcontractor accountability for safety require improvement. The use of subcontractors in performing specialized activities associated with facility deactivation and decommissioning and environmental restoration is accelerating.

Contract reform has brought to the Department certain changes that, while cost-effective, can affect the safety of operations and the Department's ability to perform line oversight. Contractual arrangements that capitalize on the entrepreneurial creativity and skills of private industry (i.e., privatization) offer attractive solutions to enormous environment, safety, and health problems, especially in the areas of waste and spent fuel management. However, the release of operational control of activities to private firms is not being accompanied by an appropriate level of Departmental line oversight of privatized functions.

Some sites are transitioning from management and operating (M&O) to management and integrating (M&I) contracts, as the latter has the potential to yield significant cost savings. The M&I arrangement generally includes significant use of independent subcontractors, thus complicating the line oversight responsibilities of the M&I contractor and the Department.

The contract reform movement is important to the future success of the Department's environmental restoration initiatives. However, it must proceed with caution and order.

MAINTENANCE OF A CURRENT AND APPROPRIATE AUTHORIZATION BASIS

While the existence and currency of authorization basis documentation has improved over the past several years, there appears to be fundamental weaknesses in the understanding of the need for such documentation and related safety analyses. Several sites have made great strides in

ensuring that their facilities operate under safety bases. There is the impression that some sites have done so only in response to Departmental pressure, rather than in recognition that such analyses are valuable. There appears to be a tendency to operate under the original safety documentation, even when facility requirements, processes, and hazards change. Some sites have made little or no progress in developing or updating documentation.

Facility authorization basis analyses do not always incorporate worker safety considerations, and the quality of task-related hazard analysis is weak. "Safety envelopes" are frequently violated, with potentially serious results. In general, such violations can be attributed to: (1) a lack of familiarity with the safety analyses or the safety analysis process, including underlying assumptions; (2) lack of familiarity with approved procedures; or (3) a deliberate decision to circumvent the approved procedure because of deficiencies in the procedure, inability to perform according to the procedure, or other pressures, such as time and budget constraints.

There is a need to ensure that personnel preparing authorization basis documentation are competent and comprehensively trained. Some sites appear to rely on a small pool of experts, while other sites have unqualified personnel performing unreviewed safety question determinations. This situation can lead to unacceptable delays in document preparation or, if proper internal oversight is not provided, to approval of inadequate documentation.

ASSESSMENT OF ENVIRONMENT, SAFETY, AND HEALTH PERFORMANCE AND MANAGEMENT OF CORRECTIVE ACTIONS

Self-assessment and corrective action programs are fundamental to improving and sustaining performance. The effectiveness of these programs also indicates an organization's commitment to safety management. The recurrence of similar deficiencies within sites and across the complex suggests that these programs are not meeting their intended objectives.

While some individual sites exhibit the essential elements of a comprehensive internal oversight program, most sites exhibit one or more of the following weaknesses: (1) lack of consistent and rigorous management involvement in assessing the performance of safety management programs, (2) self-assessment programs that do not effectively identify root or systemic causes, (3) corrective actions that are not closed in an efficient manner, and (4) corrective action management systems that do not effectively prioritize recommended actions within the context of established sitewide priorities and are not integrated with sitewide budgeting and planning processes.

These limitations hinder the identification of systemic weaknesses and strengths, and the sharing of lessons learned. Current inconsistencies in site reporting systems, including limitations that preclude providing complete, unbiased, and reliable information, diminish their ability to assist line management in identifying safety performance trends and implementing safety improvements. Many Department-wide safety problems result from a lack of information for establishing work controls or from deficient management processes for ensuring safe conduct of work.

PLANNING AND CONTROL OF WORK — ANALYSIS OF HAZARDS

Rigorous planning of work activities with an understanding of the attendant hazards to be addressed and mitigated is a critical function in a complex that increasingly emphasizes restoration and decontamination and decommissioning activities.

The work planning function is not effective in involving personnel responsible for safety-related tasks and ensuring that all hazards are systematically addressed before work begins. The lack of a disciplined approach to work planning and control often results in an environment that condones workarounds and non-compliance with procedures, prefers reliance on the skill of the craft over required engineering data and controls, and fails to enforce safety and procedural standards and hold workers accountable for personnel errors.

Office of Oversight data indicate that hazard identification and analysis are frequently insufficient and are allowed to become obsolete with no attempt to maintain currency. Cases of unqualified staff conducting hazard analysis and review, with no followup by qualified personnel, contribute to work planning problems. This situation can also lead to insufficient understanding of a facility's or activity's safety basis.

The Department is not adequately positioned to deal with the safety impacts of recent and ongoing downsizing. As the site-specific "corporate memory" is diminishing, there are only limited efforts to capture and document it. In an environment where accurate drawings (e.g., piping, instrumentation, and electrical) are both a necessity and a rarity, a more aggressive posture is needed to ensure safety.

CONDUCT OF OPERATIONS

Understanding and implementing conduct of operations principles vary widely among sites and among facilities. Problems in this area appear to stem from a lack of understanding and commitment to a philosophy of rigor and discipline. This may

result from the facts that facility managers often have great latitude in identifying requirements to be implemented, and that individual site contractors often operate from their own set of procedures. The increased use of subcontractors complicates the consistent flowdown of requirements and indicates the need for additional effort and discipline to ensure adequate communication.

There is a pervasive problem with the quality of and adherence to approved operating procedures. Most conduct of operations violations can be traced to either personnel error or procedure violation. Many site procedures are poorly prepared, do not address current working conditions, and are based on inadequate hazards analyses. Corrective actions are often ineffective because they do not address the continuing lack of procedure adherence. There remains a tendency to rely on expertise rather than on standardized procedures. Conversely, sites that have sound training programs tend to exhibit effective conduct of operations.

Poor performance in conduct of operations has broad reaching effects and directly impacts such worker safety programs as electrical and construction safety. Despite the Department's emphasis on conduct of operations, it is evident that objectives in this area have not yet been achieved.

MANAGEMENT OF SUBCONTRACTORS

The new wave of contractual arrangements resulting from contract reform measures has significantly increased the scope and number of subcontractors at Department of Energy sites. This situation creates additional burdens on prime contractor and Departmental management resources to perform oversight of subcontractors commensurate with the hazards of the work being conducted.

In comparison with Departmental and prime contractor staff, this subcontractor work force is often less knowledgeable of facility history, less capable of recognizing and quantifying hazards, and much more dependent on accurate work documentation (e.g., schematics, work permits, configuration data) and good communications concerning work authorization and work control changes. Further compounding this condition are the instability of the Department's workforce and a decline in the apprenticeship programs for certain trades.

Subcontractor activities appear to be held to a different standard in that the Department presumes a transfer of safety responsibilities when work is conducted for a prime contractor. This attitude is reflected in the lack of line safety oversight afforded these activities and the clear difference in the reporting of incidents and handling of corrective actions for subcontractor activities.

OUTLOOK

The Department's safety management systems are continuing to improve, as demonstrated principally by advances in public safety and environmental protection. Maintaining and advancing these improvements will require that safety be instilled in the culture of the entire work force. This can be accomplished by clarifying roles and responsibilities, establishing accountability for expected performance, implementing applicable requirements, and sustaining a work force capable of analyzing, planning, and executing work consistent with sitewide risks and hazards. This shift in safety culture will require the commitment, leadership, and attentiveness of senior management.

The safety of the work environment at the "shop floor" will continue to be affected by mission changes, an aging complex and infrastructure, diminishing resources, and the transition to external regulation. Managers will find it increasingly difficult to balance safety and mission requirements. This challenge may intensify if the line organization does not more effectively apply lessons learned and manage the skills of the work force.

The effectiveness of safety management systems will be measured in their ability to react swiftly and accurately. Delays in resolving important issues have often resulted from weak systems for tracking and prioritizing sitewide corrective actions and accurately communicating important information promptly to management. The Department must work quickly to overcome these deficiencies. As the Department continues to apply contract reform initiatives to enhance resolution of environment, safety, and health problems, caution must be exercised to maintain the integrity of its safety management system.

TABLE 1. OFFICE OF OVERSIGHT REPORTS ADDRESSING PRINCIPAL ACTIVITIES PERFORMED DURING 1996*

REPORT TITLE	ACTIVITY	PUBLICATION
Type A Accident Investigation Board Report on the February 20, 1996 Fall Fatality at the Radioactive Waste Management Complex Transuranic Storage Area - Retrieval Enclosure, Idaho National Engineering Laboratory	Accident Investigation	March 1996
Independent Oversight Evaluation of Environment, Safety and Health Programs, Hanford Site	Comprehensive Inspection	April 1996
Type A Accident Investigation Board Report on the January 17, 1996 Electrical Accident with Injury in Building 209, Technical Area 21, Los Alamos National Laboratory	Accident Investigation	April 1996
Independent Oversight Review of the Department of Energy Quality Assurance Program for Suspect/Counterfeit Parts	Review	May 1996
Independent Oversight Evaluation of Environment, Safety and Health Programs, Fernald Environmental Management Project	Comprehensive Inspection	May 1996
Independent Oversight Evaluation of Environment, Safety and Health Programs, Strategic Petroleum Reserve	Comprehensive Inspection	June 1996
Type A Accident Investigation Review Board Report, July 11, 1996 Electric Shock at Technical Area 53, Building MPF-14, Los Alamos National Laboratory	Accident Investigation	August 1996
Type A Accident Investigation Board Report, August 13, 1996 Electrical Shock at TRA-609, Test Reactor Area, Idaho National Engineering Laboratory	Accident Investigation	September 1996
Independent Oversight Review of Aviation Safety in the Department of Energy	Special Study	October 1996
Hoisting and Rigging Incidents within the Department of Energy	Special Study	October 1996
Independent Oversight Evaluation of Headquarters and Albuquerque Operations Office Management of Environment, Safety and Health Programs at the Los Alamos National Laboratory	Comprehensive Inspection	October 1996
Independent Oversight Evaluation of Headquarters and Albuquerque Operations Office Management of Environment, Safety and Health Programs at the Pantex Plant	Comprehensive Inspection	October 1996
Yucca Mountain Site Characterization Project Industrial Hygiene Program	Compliance-based inspection	January 1997

***** The Office of Oversight also conducted and documented over 100 surveillances during 1996.